instructed to recognise its merits, and sufficiently humble and enterprising to stoop to learn anew, and by a better method, the elements of their science), take its place at the head of elementary treatises on its subject. It is by no means faultless: no first edition on so new a plan could quite avoid confusion; there is excess of detail on many points, too little on others, and the language, though generally correct throughout, is sometimes almost mystical. This is not a reproach—quite the reverse—for it is mainly in these passages that we feel the strength of the author, and we are unfortunately not speaking from the beginner's point of view. He has evidently thought deeply, and the result is in all cases well worthy of careful study, especially for those who think themselves thoroughly masters, if but of the merest elements. No one can read the work without feeling that he has still something to learn, even in the most prosaic parts of the science. Dr. Stewart does not, as it were, follow the ordinary laws of war; he abjures pipe-clay and red tape, and he has a method of his own which we cannot but think is calculated to do a real service to the beginner. Even methods in mathematics cannot be stereotyped; Euclid is about to be laid on the shelf; and it is not at all unlikely that in a few years the so-called Cartesian x, y, z, will disappear, to make way for Hamilton and his vectors. Thus it is, and shall be, with the so-called *statical* proofs of the Parallelogram of Forces, we shall get back to Newton's methods as nearly as modern nomenclature will permit; and so likewise in other parts of physics. The reign of *inartificiality* and *simplicity* must soon be inaugurated, and this work will greatly tend to hasten its advent.

It would be improper to finish without finding some additional fault, especially after all we have said in praise of the work, and even Dr. Stewart's recent accident (from the effects of which we are delighted to hear he is steadily recovering) must not influence us.

The printing is excellent; but some of the woodcuts (the balance, p. 59, and the strained beam, p. 71, for instance) are not merely execrable, but, what is far worse, misleading. No mention is made of the Peltier effect at a thermoelectric junction, nor is Sir W. Thomson's so-called "specific heat of electricity" alluded to, though both might easily have been introduced without increasing by more than a page or so the bulk of the volume. These are matters of such fundamental importance, and are capable of such easy description, that they certainly ought to have been given. There are other points of a similar kind, but it is not necessary to mention them.

Dr. Stewart very fully treats of the grand question of the equality of Radiation and Absorption, the question which first brought him prominently before the scientific world; but he has done it with such an excess of modesty that his own genuine claims might be endangered, were there not happily other works in which his services to this important branch of science are fully recognised.

It is peculiarly sad that Prof. Stewart should have been temporarily disabled just when he was getting into working order his Physical Laboratory in Manchester: no one is better fitted for such work than he is; let us hope that he may soon be in a position to resume the direction of it, and to teach beginners by means of his excellent Manual.

P. G. TAIT

OUR BOOK SHELF

The Academy. Vol. I. (London: Williams and Norgate, 1870.)

WE congratulate our twin brother (or sister?) the *Academy*, on the appearance of its first volume. The journal had at its starting a clear *raison d'être*, to respond "to a widely felt and constantly expressed dissatisfaction with the existing organs of literary and scientific criticism." The wide field embraced in the programme has rendered the editor's task anything but an easy one. Of the literary department it does not come within our province to speak; the scientific portion, we can fairly say, has been honestly and ably executed. This department consists of two sections—original reviews, and scientific notes. The former, in accordance with the practice of the rest of the paper, are all signed. The desirability of signed articles is one that has been much debated. Whatever may be its relative advantages or disadvantages in literature or politics, we are convinced that in science the former greatly outweigh the latter. In reading a criticism on a scientific work, it is before all things necessary that we should know that the critic has a right, from his own knowledge of the subject, to speak with authority. The signatures to the scientific articles which will be found in this volume are themselves sufficient guarantee that the subject is discussed from a standpoint from which something is to be gained by the reader. The scientific notes consist of paragraphs under the various heads of chemistry, physics, geology, zoology, botany, physiology, &c., epitomising the most important discoveries or researches of the month. Though the subjects are rather unequally treated, the notes have evidently been drawn up with great care by competent men, and the whole gives a very fair *résumé* of the more important advances in each department of science. If we might mention one section that appears to us to have been particularly well done, it is that of physiology. A list of the new books of the month, English and foreign, is also given, and the titles of the more important scientific magazine articles, with occasional abstracts of them. We notice with pleasure the conscientious manner in which the editor invariably acknowledges the source of his information, a practice we could wish to see more generally carried out by his brothers of the craft. Other literary journals have been content hitherto to supply their readers with their modicum of science either second-hand and very much out of date, or with a disregard to accuracy which has rendered it perfectly valueless. The *Academy* is doing good service in bringing scientific subjects before educated readers who have no special scientific bias, in a style that is likely to interest them in it, and in a manner that may be relied on as sound and accurate, and calculated to increase the knowledge in which they are, as a rule, so lamentably deficient.

Die Praxis der Naturgeschichte. Zweiter Theil: Dermoplastik und Museologie, oder das Modelliren der Thiere und das Aufstellen und Erhalten von Naturaliensammlungen. Unter Mitwirkung von Präparator Bauer, Prof. Dr. G. Jäger, Stadtdirektions Arzt Dr. Steudel, und der Thier- und Landschafts-Maler, Paul Meyerheim und Friedrich Specht; von Philipp Leopold Martin. 8vo, pp. 240, six plates. (Weimar: B. F. Voigt. London: Williams and Norgate 1870.)

FEW tasks are more distressing to a right-minded naturalist than the inspection of the ordinary mounted specimens of animals in most museums in this country and elsewhere. More hideous spectacles than usually meet one's eyes when visiting these establishments it is impossible for man to form, or mind to imagine. Some little advance, it is true, has been made of late years, upon what was formerly the prevailing type of a "stuffed beast." But no real reform can take place until the curators of museums have come to recognise the great

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truth, that, unless such objects are properly mounted, it is worse than useless to exhibit them to the public at all. They should be taken down and stowed away in drawers, or preserved in any other way that may be convenient for scientific study. Left in their glass cases, they are much more likely to repel than to attract the ordinary observer, for whose benefit the exhibition is intended.

Under such circumstances we cannot receive otherwise than with pleasure a treatise prepared with the view of teaching the true principles of the art of taxidermy and their proper application. The Royal Cabinet of Natural History at Stuttgart is well known to those who have visited it as one of the few institutions of this kind where real care and skill are exhibited in the mounting of the specimens, and no one can be more fitted than its energetic "*preparateur*" to give instructions upon a subject of which he has shown such perfect knowledge. Herr Martin has, moreover, obtained the assistance of several individuals who are fully qualified to assist him in his task, which appears to have somewhat of a comprehensive scope. In a former part of the present work, Herr Martin has treated of the various methods of collecting animals of all sorts in the field, and of preserving them for scientific purposes. The fact of a third edition of this former part having been already called for shows that the work has been appreciated by those or whose instruction it is designed. In the present section of his volume, Mr. Martin and his fellow-workers treat more especially of the processes to be performed in the museum itself, such as the modelling in plaster of beasts large and small, the formation of preparations of the internal organs, the making of skeletons, and the mounting of microscopical objects. Full instructions are likewise given upon every point connected with the practical working of a public museum, not only as regard the objects themselves, and the best mode of exhibiting them, but also in relation to the wants and requirements of the visitors that resort to such institutions.

P. L. S.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

Mimicry versus Hybridity

BEFORE attempting to combat the old theory under which Mr. Murray has taken refuge, in opposition to the theory propounded by Mr. Bates, I must first make a few remarks upon the different forms of mimicry to which the Lepidoptera are subject.

Mimicry may be divided into two heads, viz. :—the mimicry of one lepidopterous insect by another, and the mimicry of the vegetable kingdom, and of backgrounds generally, by Lepidoptera. As Mr. Murray doubtless refers to only the first of these heads when he speaks of hybridisation, I need not trouble the reader with any remarks respecting the second. Mimicry, then, between butterflies and moths, may again be divided into three sections : that which modifies both sexes, that which chiefly modifies the females, and, lastly, that which chiefly modifies the males ;[*] these variations of modification are all easily explained by the theory of protective assimilation variously adapted to the economy of the different modified species ; but it can in no way be explained by the theory of modification by hybridity. Mr. Murray speaks of hybridisation as if it were a thing recognised by lepidopterists, and of no uncommon occurrence, whereas it has, so far as I know, only occurred in the Heterocerous Lepidoptera, and only between species of the same genus ; there is, indeed, a case on record of a skipper butterfly and a burnet moth being taken *in coitu*, but no reasonable being could expect that any issue would result from such an union ; again, I maintain that if it were even possible for hybridity to occur between different sub-orders, families, or even genera of Lepidoptera (which, by the way, is as likely as hybridity between a vulture and a dove or a horse and a rabbit), the offspring would inevitably be modified in structure just as much as hybrids between distinct races or species of vertebrates are ; they would moreover, if fertile, certainly revert to one or other of the parent stocks, which, however we do not find to be the case ; if the fertilisation of flowers and butterflies were the same, hybrids might be as common in the one case as the other, and the results attained might be more nearly alike ; but as butterflies are not fertilised through the transmission of pollen by external agencies, and as they seem to have a decided preference for mates belonging to their own peculiar species, hybridisation must needs be a thing almost unknown amongst them. Lastly, I need scarcely say that the fact of birds hunting by sight and not by smell only does not in any way destroy the argument respecting the favoured and non-favoured species of Lepidoptera ; the same thing may be said of lizards, frogs, dragon-flies, and spiders, which all of them persecute the order, and which all avoid not those insects only which have a peculiar odour, but those which, like the *Danainæ*, *Hel.coninæ*, *Acærinæ*, and others, have an acrid taste resulting from an offensive liquid which they exude from the body. I have been more fortunate than Mr. Scudder, inasmuch as I have frequently seen birds catch and devour the unprotected species upon the wing, whilst I have received abundant evidence both from scientific and non-scientific collectors respecting the perfect immunity which the *Danainæ*, &c., enjoy from all kinds of persecution, whilst their less fortunate brethren come to an untimely end.[*]

British Museum ARTHUR G. BUTLER

I AM rather surprised that Mr. Andrew Murray should have advanced his theory of mimicry being due to hybridisation, without adducing one solitary fact to prove that hybridisation between distinct *families* of insects ever occurs, or that, if it do occur, the offspring are fertile *inter se*. Mimicry is most frequent between very distinct *families* or higher groups, and often between different *orders* of insects. We may fairly consider that the "natural orders" of plants, as being the next well-marked groups above genera, are about equivalent to the *families* of insects, so that the analogy furnished by hybridisation among plants, on which alone Mr. Murray's theory is founded, wholly breaks down, unless he can show (which he has not done) that such hybridisation occurs between species of different "natural orders," or of well-marked groups higher than genera. It would be mere waste of time to discuss the details of a theory whose fundamental assumption is not only quite unsupported by fact, but is diametrically opposed to the almost, if not quite, universal fact that hybrids do not occur between species of different families or higher groups.

Mr. Scudder's letter contains some interesting and suggestive facts, and opens up a new field of investigation as to the immunity of certain species, in their egg or larva state, from the attacks of hymenopterous and dipterous parasites. It is, I believe, now stated for the first time, that the peculiar secretions which render the Danaidæ distasteful to birds not only extend to their larva and egg state, but act as a safeguard from the attacks of parasites. The objection that it would have been more advantageous for the larva than for the imago of the *Limenitis misippus* to mimic the *Danais archippus*, appears to me to have no weight. We do not know, for instance, if such mimicry would be any defence against parasites who may be guided by smell rather than sight ; and from the frequent limitation of certain odours and secretions to whole genera or families, the variations necessary to produce them may be of rare occurrence.

The fact that *Limenitis misippus* and *L. ursula* are about equally plentiful is not at all remarkable, since there are species of all degrees of rarity in every extensive group ; but in this case it happens that both insects are mimickers, *Limenitis ursula* resembling the common N. American *Papilio philenor*, especially on the under side, which is exposed when the insects are at rest. This case of mimicry is not so perfect or so striking as the other, but that it is one is pretty certain, and there are several other

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[*] An interesting illustration of this type of mimicry exists between the genera *Belenois* and *Mylothris*, the males of the African group of *Mylothris* being identical in colour with males of the genus *Belenois* (sub-family Peirinæ).

[*] The Hon. Mr. Justice Newton, who assiduously collected and took notes upon the Lepidoptera of Bombay, informed me that the *Charaxes Psaphon* of Westwood was continually persecuted by the bulbul, so that he rarely captured a specimen of this species which had not a piece snipped out of the hind wings ; he offered one to a bulbul which he had in a cage, and it was greedily devoured, whilst it was only by repeated persecution that he succeeded in inducing the bird to touch a *Danais*, which he offered to it.

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